① Find $A+B$ and $A \cdot B$

(a) $A = \begin{bmatrix} 1 & 2 \\ 5 & -4 \\ 6 & 0 \end{bmatrix}$

$B = \begin{bmatrix} 6 & -2 & 8 \\ 4 & 0 & 0 \end{bmatrix}$

(b) $A = \begin{bmatrix} 1 & 5 & 6 \\ 2 & -4 & 0 \end{bmatrix}$

$B = \begin{bmatrix} 7 & 5 & 2 \\ 0 & 1 & 0 \end{bmatrix}$

② Solve with Elimination, Gaussian Elimination, and with the calculator:

$$2x + y - z = 5$$
$$3x - y + 2z = -1$$
$$x - y - z = 0$$

$$\begin{bmatrix} 1 & 5 & 6 \\ 2 & -4 & 0 \end{bmatrix} \cdot \begin{bmatrix} 7 & 3 & 2 \\ 0 & 1 & 0 \end{bmatrix} = \text{?}$$

③ $2x + y - z = 5$
$3x - y + 2z = -1$
$x - y - z = 0$

$2x + y - z = 5$
$3x - y + 2z = -1$
$5x + z = 4$

$2x + y - z = 5$
$x - y - z = 0$
$3x - 2z = 5$

$+2(5x + z = 4)$
$3x - 2z = 5$

$+10x - 2z = 18$
$3x - 2z = 5$
$13x = 13$

$x = 1$

$5(1) + z = 4$
$z = -1$

$2(1) + y - (-1) = 5$
$y = 2$

$x = 1 \quad y = 2 \quad z = -1$

2) $\begin{bmatrix} 2 & 1 & -1 \\ 3 & -1 & 2 \\ 1 & -1 & -1 \end{bmatrix} \cdot \begin{bmatrix} 5 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$ ← with calculator

$\left[\begin{array}{ccc|c} 2 & 1 & -1 & 5 \\ 3 & -1 & 2 & -1 \\ 1 & -1 & -1 & 0 \end{array}\right]$ Switch $R_1 \leftrightarrow R_3$ $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 3 & -1 & 2 & -1 \\ 2 & 1 & -1 & 5 \end{array}\right]$ $R_1 \cdot -3$ $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 3 & -1 & 2 & -1 \\ 2 & 1 & -1 & 5 \end{array}\right]$

R_2+R_1 $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & 2 & 5 & -1 \\ 2 & 1 & -1 & 5 \end{array}\right]$ $R_1 \cdot -2$ $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & 2 & 5 & -1 \\ 2 & 1 & -1 & 5 \end{array}\right]$ R_3+R_1 $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & 2 & 5 & -1 \\ 0 & 3 & 1 & 5 \end{array}\right]$

$\frac{R_2}{2}$ $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & 1 & \frac{5}{2} & -\frac{1}{2} \\ 0 & 3 & 1 & 5 \end{array}\right]$ $R_2 \cdot -3$ $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & -3 & -\frac{15}{2} & \frac{3}{2} \\ 0 & 3 & 1 & 5 \end{array}\right]$ R_3+R_2 $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & 1 & \frac{5}{2} & -\frac{1}{2} \\ 0 & 0 & -\frac{13}{2} & \frac{13}{2} \end{array}\right]$

$\frac{R_3}{-\frac{13}{2}}$ $\rightarrow$ $\left[\begin{array}{ccc|c} 1 & -1 & -1 & 0 \\ 0 & 1 & \frac{5}{2} & -\frac{1}{2} \\ 0 & 0 & 1 & -1 \end{array}\right]$

$x - y - z = 0$

$y + \frac{5}{2}z = -\frac{1}{2}$

$\boxed{z = -1}$

$y + \frac{5}{2}(-1) = -\frac{1}{2}$

$y - \frac{5}{2} = -\frac{1}{2}$

$+\frac{5}{2} \quad +\frac{5}{2}$

$\boxed{y = 2}$

$x - 2 + 1 = 0$

$x - 1 = 0$

$+1 \quad +1$

$\boxed{x = 1}$

On Calc.

$$\begin{bmatrix} 2 & 1 & -1 \\ 3 & -1 & 2 \\ 1 & -1 & -1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ -1 \\ 0 \end{bmatrix}$$

$$A \cdot X = B$$

$$X = A^{-1} \cdot B$$

Chapter 7:

(1) Linear Systems Review Handout

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(2) Sect. 7.1 #15-18(do 2), 67, 70, 71
Sect. 7.2 #7-15(do 2), 8, 10, 61, 63, 67

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(3) Sect. 7.3 #2,9,13,16,37,40

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(4) Sect. 7.3 #14,15,17,18,19

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(5) Sect. 7.4 #2-12(even), 55, 59
Sect. 7.5 #3,5,26,28,29

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(6) Sect. 7.6 #1, 13, 15, 17, 26, 41, 42, 44
Sect. 7.7 #1-4, 51